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# An exploration of reputation formation in experimental games

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## Abstract

This paper presents results from experiments with finitely repeated games with complete and incomplete information. We use two treatment variables: the number of rounds the game is played and the value of the probability that reflects the presence of incomplete information. We explore whether shorter games lead to results closer to the sequential equilibrium prediction than longer games. The behavior we observe deviates from the precise rules of behavior implied by the notion of sequential equilibrium. Behavior in some of the shorter games deviates even more from the sequential equilibrium prediction than that in longer games. A very general notion of reputation formation does capture most of the qualitative features of the data.

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## 1. Introduction

Reputation formation in situations of finitely repeated interaction has been studied both theoretically and by means of experiments. Selten (1978) introduced the problem. The situation he considered is one of complete information about players' payoff structures. For this case, the backward induction principle leads to the game-theoretic prediction that play in the repeated situation will just be the repetition of what play would be if the interaction just took place once.

Selten argues that the notion of backward induction is very compelling for the last periods of the game but that it is not a convincing theory for all the periods of the game. In general

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it should be expected that players will behave differently than in the one-shot situation. More specifically, in early periods of the game players may behave differently than in the one-shot situation with the objective of profitably influencing their partners' behavior in later periods. This is what, in the most general sense, is meant by reputation formation.

Reputation formation can be thought of in different ways. Kreps and Wilson (1982) and Milgrom and Roberts (1982) present game-theoretic models where reputation formation in finitely repeated games arises as a sequential equilibrium phenomenon. The key idea behind these models is that, in actual economic contexts, reputation building might arise because there is some uncertainty about players' payoffs. The sequential equilibrium concept provides not only a rationale for reputation formation that is consistent with standard economic analysis, but also a prediction, in terms of very precise rules of behavior, that can easily be taken to the data.

Selten's explanation of reputation formation is based on a bounded rationality view of decision-making and is unrelated to the presence of incomplete information. In his view: "a player may imagine that 'in the beginning' something else will happen than 'towards the end' without having any clear view of the extension of these vaguely defined parts of the game" (Selten, 1978, p. 153). For the chain-store game this means that entrants frequently stay out in early rounds and the incumbent fights entry, but precise rules of behavior are not laid down.

Camerer and Weigelt (1988) (hereafter, CW) study reputation formation in experiments involving several variations of a finitely repeated game with induced incomplete information. They find that the observed pattern of play is consistent with the predictions of a sequential equilibrium for which the probability representing the uncertainty about players' payoffs is different than the one embedded in the experimental situation. In an experimental study using a different game, Jung et al. (1994) also find reputation formation both under complete and incomplete information. However, the specific pattern of reputation that is observed by Jung, Kagel and Levin (hereafter, JKL) can not be rationalized by the type of homemade beliefs considered by CW. Neral and Ochs (1992), (hereafter, NO), replicate the CW experiments with incomplete information with the same payoffs and obtain very similar results. With a certain modification of the structure of payoffs, NO also find strong reputation formation. However, the change in behavior that is observed after payoffs have been altered is not consistent with the change predicted by the sequential equilibrium concept. Behavior for the two different payoff structures can, therefore, not easily be rationalized in terms of the same homemade beliefs.

A possible explanation for some of the findings can be found by going back to Selten's view. Selten argues that: "on the level of imagination, a clear and detailed visualization of a sequence of two, three or four periods is possible—the exact number is not important. A similarly clear and detailed visualization of a sequence of 20 periods is not possible. For a small number of periods, the conclusions of the induction argument can be obtained by the visualization of scenarios. For a large number of periods the scenarios will either be restricted to several periods, e.g. at the end of the game, or the visualization will be vague in the sense that the individual periods are not seen in detail" (Selten, 1978, p. 153).

From this perspective, the features of the reputation formation observed in experimental games could just be due to the length of the games used by CW, JKL and NO. Both CW and JKL experiment with games with eight rounds and NO with games with six rounds.

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